FL380RC



4 DIN MODULES MULTI FUNCTION THREE PHASE ENERGY METER WITH ROGOWSKI COILS

User Manual v11

Warni	ngs
Importa Mainter informa procedu	nt Safety Information is contained in the nance section. Familiarize yourself with this tion before attempting installation or other ires. Symbols used in this document:
	Risk of Danger: These instructions contain important safety information. Read them before starting installation or servicing of the equipmen
4	Caution: Risk of Electric Shock

1.Introduction

is document provides operating, maintenance, installation and Instructions. The FL380RC is an innovative instrument for measurement and recording electrical parameters.

It is particularly suitable for consumption measurement and analysis with high quality and stability.

The meter directly connects with Rogowski coils for current measurement without integrator.

It measures and displays the characteristics of single phase two wire(1p2w) and three phase four wire(3p4w) networks.

The measuring parameters include voltage(V), frequency(Hz), current(A), power(kW/kVA/kVAr), import, export and total energy(kWh/kVArh).

The unit can also measure Maximum demand current and power, which is measured over preset periods of up to 60 minutes. FL380RC can communicate through the RS485 serialport by MODBUS RTU protocol.Configuration is password protected

1.1 Unit Characteristics

The Unit can measure and display:

 Voltage and THD% (total harmonic distortion) of all phases Line frequency

- Currents, current demand and current THD% of all phases
- Power, maximum power demand and power factor
 Active energy imported and exported

· Reactive energy imported and exported

1.2 Rogowski Coils Primary Current Input

FL380RC is operated directly with Rogowski coils witouth integrator. The ratio of connected Rogowski coils should be standard 85mV/kA

The primary current ranges from 1A to 5000A with 3 selectable scales. The CT1 setting depends on the current input of Rogowski coils.

If the input of coils is 500A, the CT1 should be set to 0.5kA.

If the input of coils is 1000A, the CT1 should be set to 1kA.

If the input of coils is 5000A, the CT1 should be set to 5kA.

1.3 RS485 Modbus RTU

FL380RC has a RS485 port with ModBus RTU protocol. RS485 provides a means od remotely monitoring and controlling the unit.

Set-up screens are provided for setting up the communication port.

2.Start Up Screens



*After a short delay, the screen will display active energy

3.Measurements The buttons operate as follows:

U∕I ◀	Select the Voltage and Current display screens. In Set-up Mode, this is the "Le or "Back" button.
M A	Select the Frequency and Power factor display screens. In Set-up Mode, this is the "Up" button.
	Select the Power display, screens, In Si

up Mode, this is the "Down" button.

Select the Energy display screens. In Setup mode, this is the"Enter/Confirm"or"Right"

3.1 Voltage and Current

E.

Each si	uccessive	press o	f the U	/1,* t	outton	selects	a new	parame	te
-									

	0.0 v 0.0 0.0	Phase to neutral voltages.
L ¹ 0.0 L ² 0.0 L ³ 0.0	00 ^ 00 ^	Current on each phase.
N 0.0	00 ^	NeutralCurrent
L ¹ 00. L ² 00. L ³ 00.		Phase to neutral voltage THD%.
L ¹ 00. L ² 00. L ³ 00.	00 _{I%THD} 00 00	Current THD% for each phase.

3.2 Frequency and Power Factor and Demand

Each successive press of the T button selects a new range:

≥ 00.00 Hz 0.999 pf	Frequency and Power Factor (total).
υ υ υ υ υ υ υ υ υ υ υ υ υ υ	Power Factor of each phase.
0.000 ^{kW} S	Maximum Power Demand.

3.3 Power

Each successive press of the p button select a new range

L ^U 0.000 ^{KW} L ² 0.000 L ³ 0.000	Instantaneous Active Power in kW.		
L ¹ 0.000 kVAr L ² 0.000 kVAr L ³ 0.000	Instantaneous Reactive Power in kVAr.		
L ¹ 0.000 L ² 0.000 L ³ 0.000 KVA	Instantaneous Volt-Amps In kVA.		
0.000 ^{KW} ≥ 0.000 ^{KVA} 0.000 ^{KVA}	Total kW, kVAr, kVA.		
3.4 Energy Measurements			

Each successive press of the R to button selects a new range:



0000 ≥000.0 ^{kVarh}	Total reactive energy in kVArh.
0000 kWh	Import active energy
0.3 14	in kWh.
0000 ⁽²⁰⁰⁸⁾	Export active energy
0000 ^{kWh}	in kWh.
0000	Import reactive energy
000.0 ^{kvarh}	in kVArh.
C C C C C C KVArh	Export reactive energy in kVArh.

4.Set Up

To enter set-up mode, press the E abutton for 3 seconds, until the password screen appears.

PR55 0000	Setting up is password- protected so you must enter the correct password (default '1000') before processing.
P855	If an incorrect password is entered, the display will show:
Err	PASS Err

To exit setting-up mode, press vr repeatedly until the measurement screen is restored.

4.1 Set-up Entry Methods

Some menu items, such as password and CT, require a four-digit number entry while others, such as supply system, require selection from a number of menu options.

4.1.1 Menu Option Selection

- 1. Use the and p * buttons to scroll through the different options of the set up menu.
- 2. Press E L to confirm the selection.
- 3. If an item flashes, it can be adjusted by the $\underline{\tt r}^{\,\,{\rm A}}$ and $\overline{^{\,\,{\rm Y}}}$ buttons.
- 4. Having selected an option from the current layer, press E L to confirm your selection.
- 5. Having completed a parameter setting, press $U_{\rm set}^{-1}$ to return to a higher menu level. and you will be able to use the <u>v</u> and <u>p</u> <u>v</u> buttons for further menu selection.
- 6. On completion of all setting-up, press repeatedly until the measurement screen is restored.

4.1.2 Number Entry Procedure

When setting, some screens require entering password. In particular, on entry to the setting up section, a password m be entered. Digits are set individually, from left to right. The procedure is as follows: ord must

1. The current digit to be set flashes and is set using the $\underline{\mu}^{\star}$ and \underline{p}^{\star} buttons

2. Press E to confirm each digit setting.

3. After setting the last digit, press 112 to exit the number setting routine.

tion t that can be used for communication otocol. For Modbus RTU, parameters nt panel.

dress



On completion of the entry procedure, press confirm the setting and press $\[muthat]$ button to return the main set-up menu

4 2 2Baud Rate

582 5803 9.5 *	From the set-up menu, use u and p buttons to select the Baud Rate option.
582 5804 <mark>9.6</mark> *	Press B 2 to enter the selection routine. The current setting will flash.
582 6803 384 *	Use and P buttons to choose Baud rate 2.4k. 4.8k, 9.6k, 19.2k, 38.4k

On completion of the entry procedure, press the setting and press unit to return to the main set up menu.

4.2.3Parity

582 PR71 8080	From the set-up menu, use
SEE PRri <mark>EuEN</mark>	Press B 2 to enter the selection routine. The current setting will flash.
5EE P8r1 NONE	Use u ^A and P ^T buttons to choose parity (EVEN / ODD / NONE (default)).

On completion of the entry procedure, press **E** to confirm the setting and press **W**

4.2.4Stop Bits

582 5202 2	From the set-up menu, use
588 580P 2	Press $\mathbf{g} \gtrsim$ to enter the selection routine. The current setting will flash.
582 520P 1	Use <u>u</u> A and <u>p</u> Use buttons to choose stop bit (2 or 1) Note: Default is 1, and only when the parity is NONE that the stop bit can be changed to 2.

On completion of the entry procedure, press E to confirm the setting and press will to return to the main set up menu.

4.3CT

The CT option sets the primary current (CT1) of the rogowski coil that wires to the meter. There are 3 selectable current scales: 500A/1000A/5000A.

SEE [E] <mark>0.5</mark> **	From the set-up menu, use <u>u</u> ^A and <u>p</u> [*] buttons to select the CT option.
	Secondary CT setting Press : to enter the CT primary current selection routine.:0.5kA/1kA/ 5kA
	Press E to confirm the selection.

4.4PT

The PT option sets the secondary voltage (PT2 100 to 500V) of the voltage transformer (PT) that may be connected to the meter

5EE PE2 400	Use * and P buttons to select the PT option. The screen will show the voltage PT secondary voltage value. The default value is 400V.
5EE PE2 400	Secondary PT setting Press (2.2) to enter the PT secondary voltage selection routine. The range is from 100 to 500V.
Р£ , 8££ 000 I	Set PT ratios value Press 2. to enter the PT ratio screen. The range is from 0001 to 2000.

For example, if set the ratio to be 100, it means the primary voltage equals secondary voltage x100

ingo.	4.2Communoca
	There is a RS485 port using Modbus RTU pr are selected from fror
	4.2.1RS485 Add

4.5DIT Demand Integration Time

This sets the period in minutes over which the

and power readings are integrated for maximum demand measurement. The options are:0, 5,8,10,15,20,30, 60 minutes.		
582 812 10	From the set-up menu, use $\mathbf{x} \stackrel{\wedge}{\rightarrow}$ and $\mathbf{p} \stackrel{\vee}{\rightarrow}$ buttons to select the DIT option. The screen will show the currently selected integration time.	
582 312 10	Press to enter the selection routine. The current time interval will flash.	
582 d 12	Use x and P buttons to select the time required.	
582 d 12 20	Press to confirm the selection.	

Press W1 to exit the DIT selection routine and return to the menu.

4.6Backlit Set-up

The meter provides a function to set the blue backlit lasting time(0/5/10/30/60/120 minutes). 0 means the backlit always on.

582	Default:60
LP	If it's setted as 5,the backlit
60	will be off in 5minutes.
581 LP 60	Use u ^A and p [*] buttons to choose the time

Press E to confirm the setting and press VI to return to the main set up menu

4.7Supply System The unit has a default setting of 3Phase 4wire (3P4). Use this section to set the type of electrical system.

545 303	From the set-up menu, u A and p v buttons to select the system option. The screen will show the currently selected power supply.
535 383	Press B to enter the selection routine. The current selection will flas
5¥5 1P2	Use x and P buttons to select the required system option: 1P2(W),3P3(W),3P4(W)
535 3P4	Press E to confirm the selection.

Press will to exit the system selection routine and return to the menu. SET will disappear and you will be returned to the main set-up menu

4.8CLR

The meter provides a function to reset the maximum demand value of current and power

[lr	From the set-up menu, use and p buttons to select the reset option.
[Lr	Press E to enter the selection routine. The dlt will flash
di E	Will liddin.

Press B L to confirm the setting and press v1 to return to the main set up menu

4.9Change Password

ne enange i deenerd	
582 PR55 1000	Use the u ^A and p T to choose the change password option.
SEE PRSS 1000	Press the B to enter the change password routine. The new password screen will appear with the first digit flashing.

582 PR55 1000	Use u and p to set the first digit and press b to confirm your selection. The next digit will flash.
582 PR55 1100	Repeat the procedure for the remaining three digits.
582 PR55 1100	After setting the last digit.
Press 🗤 to exit the number s	setting routine and return to the

4.10CTReversal If the CT connections are incorrectly wired, they can be reversed through the set-up menu:

582 545 [ont	Use the L and P v buttons to select the menu option. Hold the E button to view the sub-menu.
SEŁ IR Frd	This screen will display, you can change Forward to Reverse on each individual CT connection.
582 18 780	Hold the button to confirm your adjustment. You can then move on to IB or IC using the <u>u</u> A ar <u>p</u> buttons.

Hold the $W_{L_{ac}}^{\prec}$ button for 3 seconds to exit the set up menu.

5.Specifications

5.1 Measured Parameters

The unit can monitor and display the following parameters of a single phase two wire(1p2w), three phase three wire(3p3w) or three phase four wire(3p4w) system

5.1.1 Voltage and Current

- Phase to neutral voltages 100 to 289V a.c. (not for 3p3w supplies) Voltages between phases 173 to 480V a.c. (3p supplies
- only). Percentage total voltage harmonic distortion (THD%) for each phase to N (not for 3p3w supplies).
- Percentage voltage THD% between phases (three phase supplies only).

Current THD% for each phase

5.1.2 Power factor and Frequency and Max. Demand

- Frequency in Hz
- Instantaneous power · Power 0 to 3600 MW
- Reactive power 0 to 3600 MVAr
- · Volt-amps 0 to 3600 MVA
- · Maximum demanded power since last Demand reset Power factor
- Maximum neutral demand current, since the last Demand reset (for three phase supplies only)

5.1.3 Energy Measurements

 Import/Export active energy 	0 to 9999999.9 kWh
 Import/Export reactive energy 	0 to 9999999.9 kVArh
 Total active energy 	0 to 9999999.9 kWh
Total reactive energy	0 to 9999999.9 kVArh

5.2 Measured Inputs

Voltage inputs through 4-way fixed connector with 2.5mm² standard wire capacity. single phase two wire(1p2w), three phase four wire(3p4w) unbalanced.

Three current inputs (six physical terminals) with 2.5mm² standard wire capacity for connection of external Rogowski coils. Nominal rated input current 85mV/kA a.c. RMS

5.3 Accuracy Voltage

Voltage	0.5% of range maximum
Current	0.5% of nominal
Frequency	0.2% of mid-frequency
Power factor	1% of unity (0.01)
Active power (W)	$\pm 0.5\%$ of range maximum
 Reactive power (VAr) 	\pm 1% of range maximum
 Apparent power (VA) 	\pm 1% of range maximum
 Active energy (Wh) 	Class 1 IEC 62053-21
 Reactive energy (VArh) 	$\pm 2\%$ of range maximum
Response time to step input	1s, typical, to >99% of final reading, at 50 Hz.

5.4 Auxiliary Supply

Two-way fixed connector with 2.5mm² standard wire capacity. 85 to 275V a.c. 50/60Hz ±10% or 120V to 380V d.c. ±20%. Consumption < 2W/10VA.

5.5 Interfaces for External Monitoring

RS485 communication channel that can be programmed for Modbus RTU protocol

The Modbus configuration in (baud rate etc.) is configured through the set-up screens.

5.5.1 RS485 Output for Modbus RTU

For Modbus RTU, the following RS485 communication parameters can be configured from the set-up menu: Baud rate 2400, 4800, 9600, 19200, 38400

Parity none (default) / odd / even Stop bits 1 or 2 RS485 network address nnn – 3-digit number, 1 to 247

Modbus Word order Hi/Lo byte order is set automatically to normal or reverse. It cannot be configured from the set-up menu.

5.6 Reference Conditions of Influence Quantities

nfluence Quantities are variables that errors to a minor degree. Accuracy is v	affect measurement rerified under nominal
alue (within the specified tolerance) o	f these conditions.
Ambient temperature	23°C ±1°C
Input frequency	50 or 60Hz ±2%
Input waveform	Sinusoidal (distortion factor < 0.005)
Auxiliary supply voltage	Nominal ±1%
Auxiliary supply frequency	Nominal ±1%
Auxiliary supply waveform (if AC)	Sinusoidal (distortion factor < 0.05)
Magnetic field of external origin	Terrestrial flux

5.7 Environment • (

* Maximum an exciting and ato	
Shock	30g in 3 planes
Vibration	10Hz to 50Hz, IEC 60068-2-6, 2g
 Warm up time 	5s
Altitude	Up to 2000m
Relative humidity	0 to 95%, non- condensing
 Storage temperature 	-40°C to +70°C
 Operating temperature 	-25°C to +55°C

* Maximum operating and storage temperature context of typical daily and seasonal variation. in the

5.8 Mechanics

DIN rail dimensions	72 x 94.5 mm (WxH) per DIN 43880		
Mounting	DIN rail (DIN 43880)		
 Ingress protection 	IP51 (indoor)		
Material	Self-extinguishing		
	UL94 V-0		

6.Dimensions



7.Installation

For the wiring diagram of FL380RC, different networks have different diagrams. Below are wire diagrams for 3 phase 4 wires and 1 phase 2 wires.

Current and Voltage inputs









T	RS485	0.5~2.5mm ²	
Terminals Capacity	Load	1.5~2.5mm ²	
0 T	RS485	0.4Nm	
Screw lorque	Load	0.4Nm	

8.Rogowski Coil



Coil code	Reference Rated Current	Class	Window Size (mm)	Coil Length (mm)
ESCT-RC60	500A	0.5	50	200
ESCT-RC100	1000A	0.5	100	395
ESCT-RC150	5000A	0.5	150	525